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ELECTRIC SWITCH

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*Fig. 1.*

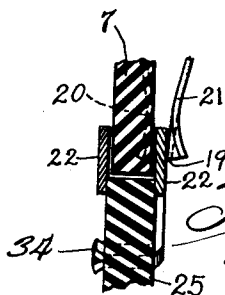
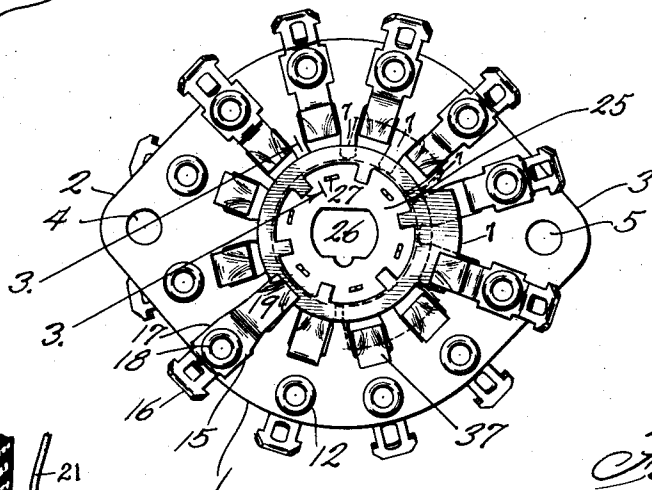


*Fig. 3.*

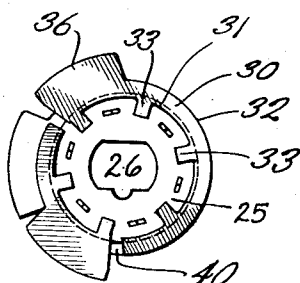
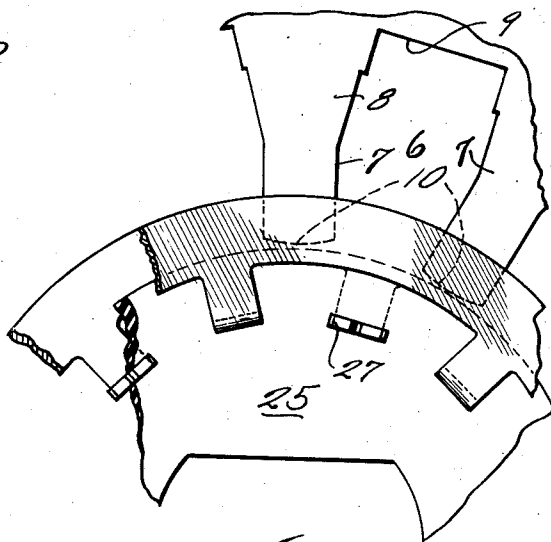


*Fig. 4.*

*Fig. 2.*



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## UNITED STATES PATENT OFFICE

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## ELECTRIC SWITCH

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20 Claims. (Cl. 200—15)

This invention relates to electric switches and particularly to switch sections in a gang removable and replaceable as units, in complex switches, such as the gang switches used in multi-band radio receivers, tube testers and the like, it is desirable to have the sections of the switch readily removable. It also is desirable, however, to have the switch sections so designed that no dismantling of each section is possible. Because the rotors are usable with all stators, it would be easily possible to misplace a rotor.

By this invention, the rotor and stator of each switch section are unitary in the sense that they cannot be dismantled and reassembled by ordinary means.

Referring to the drawing Figure 1 is a plan view of a switch section. Figure 2 is an enlarged detail. Figure 3 is a section on 3—3 of Figure 1. Figure 4 is a detail of the rotor.

The construction represents an improvement over that shown and claimed in our application S. N. 53,486 filed Dec. 9, 1935. The section comprises a stator 1 of rigid insulating material. The stator is of a generally circular shape with diametral extensions 2 and 3 having apertures 4 and 5 for support in a gang switch such as shown in Patent 2,012,492 to Arnold et al. The interior of stator 1 is cut out to form a region 6. The inner edge of stator 1 is broken up by a regular series of fingers 7 tapering at 8 from the stator body proper. Between adjacent fingers, the inner stator edge is preferably straight at 9 to form a series of chords symmetrically disposed around open region 6. It will be noted that fingers 7 extend inwardly for equal distances and the tips 10 thereof lie on the circumference of a circle.

Stator 1 has a series of apertures 12 lying on the circumference of a circle concentric with the circle defined by finger edges 10. Each aperture is disposed between adjacent fingers and behind chord 9. At each aperture, a stator contact 15 is disposed. Each contact comprises a doubled over strip of spring metal having a connecting portion 16. An eyelet 18 passing through a suitable aperture in mounting portion 17 maintains the contact rigidly in position. From mounting portion 17, the contact material extends inwardly to provide a contacting portion 19. The two layers of metal spread to form jaws 20 and 21 between whose edges 22 the rotor contact is adapted to move. It will be noted that each contact 15 snugly fits between adjacent finger portions 8 and is maintained against turning movement thereby.

Disposed within cut out region 6 is a circular rotor disk 25 of rigid insulating material. This disk is of substantially the same thickness as stator 1 and just fits into the space defined by finger tips 10. In effect, the fingers 7 form a bearing for rotor disk 25. Disk 25 has a generally

rectangular slot 26 through the center thereof for engagement with a non-circular shaft as in the Arnold et al. patent previously referred to. Disposed within the outer edge of disk 25 is a series of slots 27 spaced at regular intervals. A plurality of rotor contacts are adapted to be supported along both sides of disk 25 near the edge thereof. Each contact comprises an annular segment 30 having concentric circular inner and outer edges 31 and 32. Inner edge 31 lies just within disk edge 25 and is provided with a plurality of tongues 33 adapted to register with slots 27. These tongues have their free edges bent through the slots and staked at 34. Annular segment 30 may be of any predetermined angular extent and may be provided with one or more extensions 36 on the outer edge 32. Certain of the stator contacts, such as 37, do not extend inwardly as far as other contacts and are adapted to operate only on extension 36 of the rotor contact.

It will be noted that each stator contact jaw encloses on both sides the rotor contact on the corresponding disk side. Since the stator has contacts mounted on both sides thereof, both series of rotor contacts will be used.

The rotor contacts are distributed around each side of disk 25 so that a substantially continuous rotor contact surface results. Where the contacts are broken off, as at 40, the intervening space is too small to permit finger 7 to be free of the side contact surface. It may not be necessary to utilize all the contacts on the rotor; nevertheless, the great bearing surface presented by the rotor contacts on the stator fingers makes for a more rigid assembly, which will retain the rotor in position at all times. Furthermore, the bearing of the rotor contacts on both sides of the stator fingers removes any sideways strain from the stator contact jaws and keeps the strain on the heavy and relatively rigid rotor contacts.

It is understood of course, that enough clearances between relatively moving surfaces are provided to permit the spring contacts to align themselves perfectly from slight manufacturing inaccuracies. However, movements allowed by such clearances are well within the elastic limits of the spring contact material and has no tendency to affect the contact action or deform the contacts. Because of the close limits on uniformity of contact resistance, this becomes important.

What is claimed is:

1. A switch section, removable and replaceable as a unit, comprising a flat insulating stator having an interior portion thereof cut out to leave a plurality of inwardly extending fingers whose free ends lie on the circumference of a circle, an insulating rotor disk disposed within said cut out region and being just large enough to bear

against said fingers, said disk having a central noncircular aperture for engagement with a shaft, flat rotor contacts carried by said rotor on the sides thereof and extending beyond the disk edge to overlap at least certain of said fingers on the opposite sides thereof, and spring contacts mounted on the stator between fingers cooperating with the side surfaces of said rotor contacts and having contacting portions entirely clear of said stator.

2. A switch section, removable and replaceable as a unit, comprising a flat insulating stator having an interior portion thereof cut out to leave a plurality of inwardly extending fingers whose free ends lie on the circumference of a circle, an insulating rotor disk disposed within said cut out region and being just large enough to bear against said fingers, said disk having a central noncircular aperture for engagement with a shaft, flat rotor contacts carried by said rotor on the sides thereof and extending beyond the disk edge to overlap at least certain of said fingers on the sides thereof, and spring contacts mounted on the stator between fingers, said contacts having oppositely bent jaws enclosing the cooperating rotor contact on both sides thereof and having the jaws entirely clear of said stator.

3. A switch section, removable and replaceable as a unit, comprising a flat insulating stator having an interior portion thereof cut out to leave a plurality of inwardly extending fingers whose free ends lie on the circumference of a circle, an insulating rotor disk disposed within said cut out region and being just large enough to bear against said fingers, said disk having a central noncircular aperture for engagement with a shaft, flat rotor contacts having the shape of annular segments carried by said disk on opposite sides thereof and extending beyond the disk edge to overlap portions of the stator body, said segments being so disposed on each side that any gap between adjacent segment ends is smaller in angular extent than that of the stator fingers, and spring contacts carried by the stator between fingers, said contacts having oppositely bent jaws to enclose a rotor contact on opposite sides and having the jaws entirely clear of said stator.

4. The switch of claim 3 wherein the rotor contacts on one side of the disk form a complete annulus.

5. A switch section, removable and replaceable as a unit, comprising a flat insulating stator having an interior portion thereof cut out to leave a plurality of inwardly extending fingers whose free ends lie on the circumference of a circle, an insulating rotor disk disposed within said cut out region and being just large enough to bear against said fingers, said disk having a central noncircular aperture for engagement with a shaft, flat rotor contacts in the shape of annular segments carried by said disk on each side thereof, said contacts extending beyond the disk edge to overlap portions of the stator body, means extending from the inner edge of each contact and passing through the disk for rigidly maintaining the contact in position, and spring contacts carried by the stator having oppositely bent jaws to enclose the rotor contacts on opposite sides thereof and having the jaws entirely clear of the stator.

6. A switch section, removable and replaceable as a unit, comprising a flat insulating stator having an interior portion thereof cut out to leave a plurality of inwardly extending fingers whose

free ends lie on the circumference of a circle, an insulating rotor disk disposed within said cut out region and being just large enough to bear against said fingers, said disk having a central noncircular aperture for engagement with a shaft, flat rotor contacts in the shape of annular segments carried by said disk on each side thereof and extending beyond the disk edge to overlap portions of the stator body, said segments being so disposed that between the operating limits of the rotor there is no gap large enough for any stator finger to clear, and contacts carried by the stator on opposite sides thereof between fingers, said contacts having oppositely bent jaws to enclose the rotor contacts on both sides thereof and having the jaws entirely clear of the stator.

7. A switch section, removable and replaceable as a unit, comprising a flat insulating stator having an interior portion thereof cut out to leave a generally circular bearing surface, an insulating rotor disk disposed within said cut out region and being just large enough to bear against said surface, said disk having a central noncircular aperture for engagement with a shaft, flat rotor contacts in the shape of annular segments carried by said disk on at least one side thereof and extending beyond the disk edge, and contacts carried by the stator having spring jaws embracing said rotor contacts on opposite sides thereof and having the jaws entirely clear of the stator.

8. The switch section of claim 7 wherein said rotor contacts bear against the stator portions under them to support the rotor in position.

9. The switch section of claim 7 wherein said rotor contacts are disposed on opposite sides of the rotor and form thrust bearing surfaces against the stator sides to support the rotor.

10. An electric switch comprising a stator disc of insulating sheet material, an opening therein and a rotor mounted so as to turn in said opening, said rotor comprising a circular disc-shaped body portion having a pair of flanges thereon resting against opposite faces of said stator disc in all rotor positions, and cooperating rotor and stator contacts on said rotor and stator respectively, one of each pair of cooperating contacts being of spring material and means for mounting said spring contacts so that the contact making portion of each spring contact is entirely free of any support.

11. An electric switch comprising a stator disc of insulating material, an opening therein and a rotor mounted so as to turn in said opening, said rotor comprising a circular disc shaped body portion having a pair of flanges thereon resting against opposite faces of said stator disc in all rotor positions, cooperating rotor and stator contacts on said rotor and stator respectively, said stator contacts being of spring material and shaped to provide a pair of jaws, the rotor contacts having a blade-like shape and adapted to slide between the stator contact jaws, and means for mounting the stator contacts so that the spring contact making portion thereof is clear of any support material.

12. An electric switch comprising a stator disc of insulating material, an opening therein and a rotor mounted so as to turn in said opening, said rotor comprising a circular disc shaped body portion having a pair of flanges thereon resting against opposite faces of said stator disc in all rotor positions, cooperating series of rotor and stator contacts on said rotor and stator re-

spectively, one of said series of contacts being bladelike and rigid, the other series of contacts having spring jaws adapted to enclose the blade contacts, and means for mounting said spring contacts so that the contact making portion thereof is clear of the supporting material.

13. An electric switch comprising a stator disc of insulating material having an opening therein, a rotor construction disposed in said opening and including means bearing on opposite faces of the stator in all rotor positions, cooperating series of rotor and stator contacts on said rotor and stator respectively, said rotor contacts being blade-like and said stator contacts having spring jaws adapted to enclose said rotor contacts and means for mounting said rotor contacts so that the contact making portion thereof is free of the supporting material.

14. An electric switch comprising a stator disc of insulating material having an opening therein, a rotor construction disposed in said opening and having means bearing on at least one face of the stator in all rotor positions, rotor and stator contacts on said rotor and stator respectively, said rotor contacts being blade-like and said stator contacts having spring jaws adapted to enclose the rotor contacts on both sides thereof and means for mounting the stator contacts so that the contact making portion thereof is free of the supporting material.

15. In an electric switch, a switch section removable and replaceable as a unit, comprising a stator disc of insulating material having an opening therein and being adapted to be supported, a rotor mounted so as to turn in said opening, said rotor comprising a circular disc shaped body portion having a non-circular aperture therethrough for engagement with an operating shaft and having a pair of flanges thereon resting against opposite faces of said stator disc in all rotor positions, cooperating series of rotor and stator contacts on said rotor and stator respectively, one of said series of contacts being blade-like and rigid, another series of contacts having spring jaws adapted to enclose the blade contacts, and means for mounting said spring contacts so that the contact making portion thereof is clear of the supporting material.

16. In an electric switch, a switch section removable and replaceable as a unit, comprising a stator disc of insulating material having an opening therein and adapted to be supported, a rotor construction disposed in said opening and comprising a circular disc shaped body portion having a non-circular aperture for engagement with an operating shaft and having a pair of flanges thereon resting against opposite faces of said stator disc in all rotor positions, cooperating rotor and stator contacts on said rotor and stator respectively, said stator contacts being of spring material and shaped to provide a pair of jaws, the rotor contacts having a blade-like shape and adapted to slide between the stator contact jaws, and means for mounting the stator contacts so that the spring contact portion thereon is clear of any support material.

17. In an electric switch, a switch section removable and replaceable as a unit, comprising a stator disc of insulating material having an opening therein and adapted to be supported, a rotor

construction disposed in said opening and comprising a circular insulating disc mounted to turn in said opening and having a non-circular aperture therethrough for engagement with an operating shaft, said disc having means bearing on at least one face of the stator in all rotor positions, rotor and stator contacts on said rotor and stator respectively, said rotor contacts being blade-like and said stator contacts having spring jaws adapted to enclose the rotor contacts on both sides thereof, and means for mounting the stator contacts so that the contact making portion thereof is free of the supporting material.

18. An electric switch comprising a stationary member of insulating material having a free edge lying in a flat plane and having smooth parallel sides adjacent said edge, a thin flat insulating member having a free edge in opposed relation to said first edge with the plane thereof parallel to the planes of said smooth sides, means for movably mounting said thin member so that it may be moved in its own plane for switching, stationary spring contacts mounted on said stationary member, said contacts being disposed on opposite sides of said stationary member, each contact having a spring finger normally movable perpendicular to said thin flat member, and a rigid flat contact carried by said thin member on each side thereof, said rigid contacts lying on their flat side and bearing against the smooth sides of said stationary member in all switch positions, and means for mounting the spring contacts so that the spring contact making portion thereof is clear of any support material.

19. An electric switch comprising a stationary insulating member having a free edge lying in a flat plane with smooth parallel sides adjacent said edge, a thin flat insulating member having a free edge, means for mounting said second member so that the two edges are opposed to each other with the plane of said second member being parallel to the sides of said stationary member, said second member being movable within its plane for switching, at least one flat rigid contact carried by said second member with its flat side bearing against one of the smooth sides of said stationary member in all switch positions, spring contacts carried by said stationary member having active contacting portions bearing on the flat side of the rigid contact and normally spring biased tending to push said rigid contact away from the cooperating smooth side and means for mounting said spring contact so that the active contacting portion thereof is free of any support material whereby any lateral movement of said movable member is stopped by the rigid contact against the side of said stationary member to prevent excessive springing of the cooperating spring contact.

20. The structure of claim 19 wherein said movable member has a rigid contact on each side thereof bearing on each of the smooth sides of said stationary member in all switch positions and wherein said stationary member has spring contacts mounted on opposite sides thereof, each spring contact including a pair of jaws adapted to embrace the corresponding rigid contact on opposite sides thereof.

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